CLA-VAL **e-Smart/L2**

Electronic Advanced Controller

▶ User Manual

CLA-VAL e-Smart/L2

Electronic Advanced Controller

Table of Contents

1 ▶ INTRODUCTION

1.1 PRECAUTIONS BEFORE STARTING

⚠ : Before any intervention on the site, connect you to our internet address in order to update your e-Smart/L2 with the remote loading of the Software and Firmware (chapter 3.5).

1.2 GENERAL DISCLAIMER

In accordance with our policy of continuous development and improvement, CLA-VAL Europe reserves the right to modify or improve these products at any time without prior notice. CLA-VAL Europe assumes no liability or responsibility for any errors or omissions in the content of this document.

1.3 ENVIRONMENTAL PROTECTION

Help to preserve and protect the environment. Recycle used batteries and accessories.

1.4 TYPOGRAPHY

Throughout this manual, the following typographical conventions and symbols have been adopted to help readability:

    a.   **"Bold":** Menu, command, tab and button.

    b.   *BOLD ITALIC*: Important information.

    c.   (1): Number of the reference marks on image

    d.   **www.cla-val.ch:** Internet address.

    e.   : Some tips.

    a.   ⚠ : Warning!

2 ▶ E-SMART/L2 CHARACTERISTICS

The e-Smart/L2 can be powered from several sources (24 VDC, battery, solar panel, micro turbine, etc…). It is the perfect module to control hydraulically process.
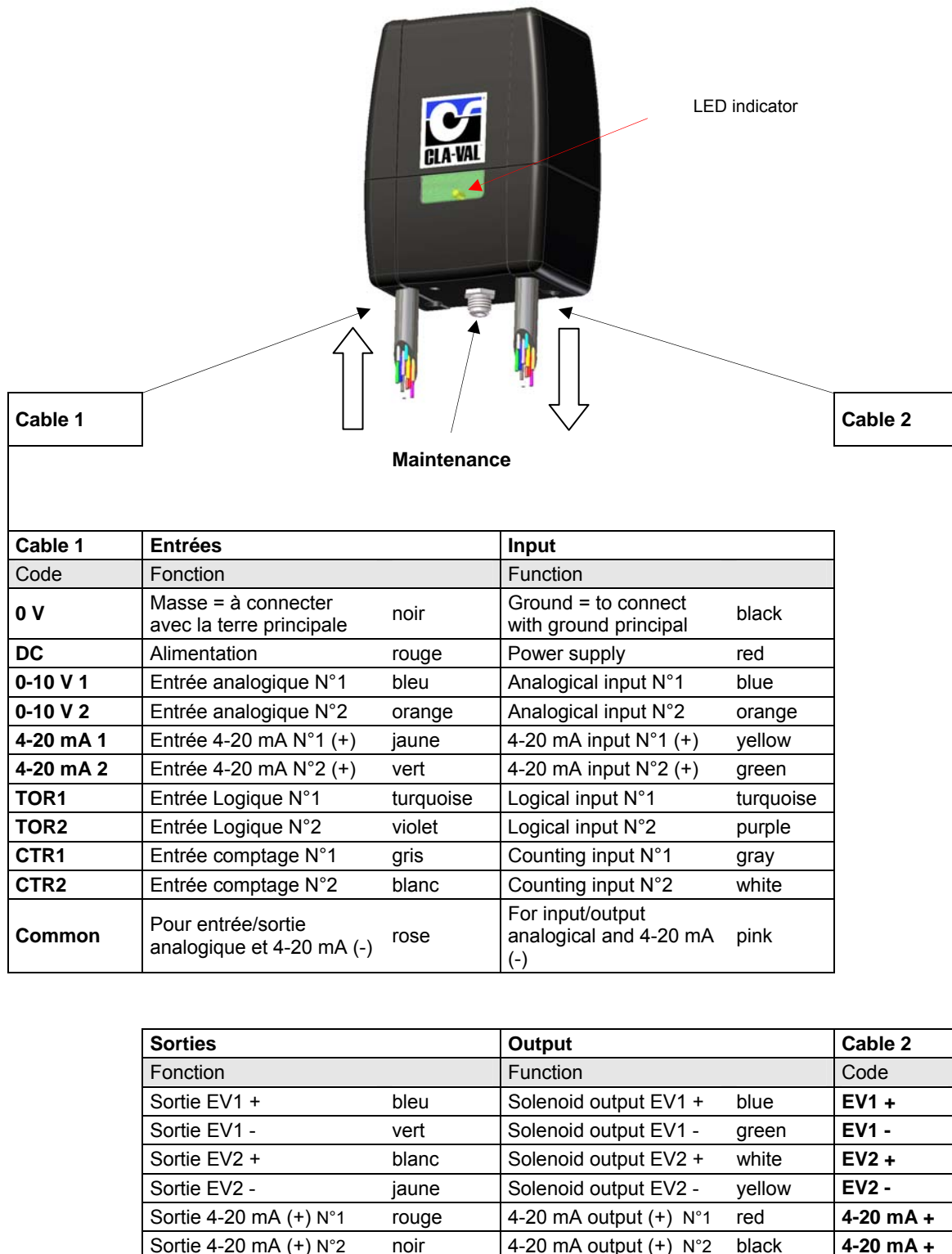
e-Smart/L2 Electronic Module (EM)

USB Wire

3   ▶ HOW TO USE THE E-SMART/L2?

3.1   WIRING DIAGRAM

LED indicator

| Cable 1 | | | | Cable 2 |

Maintenance

Cable 1	Entrées		Input	
Code	Fonction		Function	
0 V	Masse = à connecter avec la terre principale	noir	Ground = to connect with ground principal	black
DC	Alimentation	rouge	Power supply	red
0-10 V 1	Entrée analogique N°1	bleu	Analogical input N°1	blue
0-10 V 2	Entrée analogique N°2	orange	Analogical input N°2	orange
4-20 mA 1	Entrée 4-20 mA N°1 (+)	jaune	4-20 mA input N°1 (+)	yellow
4-20 mA 2	Entrée 4-20 mA N°2 (+)	vert	4-20 mA input N°2 (+)	green
TOR1	Entrée Logique N°1	turquoise	Logical input N°1	turquoise
TOR2	Entrée Logique N°2	violet	Logical input N°2	purple
CTR1	Entrée comptage N°1	gris	Counting input N°1	gray
CTR2	Entrée comptage N°2	blanc	Counting input N°2	white
Common	Pour entrée/sortie analogique et 4-20 mA (-)	rose	For input/output analogical and 4-20 mA (-)	pink

Sorties		Output		Cable 2
Fonction		Function		Code
Sortie EV1 +	bleu	Solenoid output EV1 +	blue	**EV1 +**
Sortie EV1 -	vert	Solenoid output EV1 -	green	**EV1 -**
Sortie EV2 +	blanc	Solenoid output EV2 +	white	**EV2 +**
Sortie EV2 -	jaune	Solenoid output EV2 -	yellow	**EV2 -**
Sortie 4-20 mA (+) N°1	rouge	4-20 mA output (+) N°1	red	**4-20 mA +**
Sortie 4-20 mA (+) N°2	noir	4-20 mA output (+) N°2	black	**4-20 mA +**

## 3.2 E-SMART/L2 TECHNICAL DATA

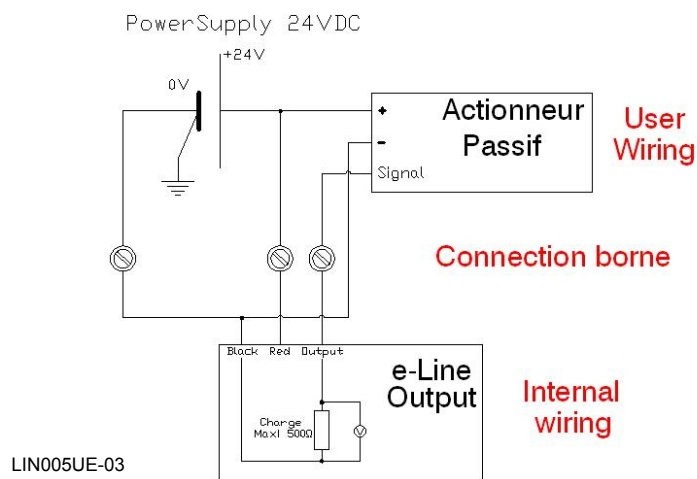|	Electrical Specifications
Electrical Power	24 VDC / 30 mA stand-by, 500 mA max. load draw Optional micro-turbine or solar panel
(*) Input (8x):	• 2x 4-20 mA (impedance 100 Ω) • 2x 0-10 VDC • 2x Logical (0-1) (max. 5 VDC / 0,1 A) • 2x Pulse (switch input) 8 Hz max
(*) Output (3x):	• 2x Power output solenoid or relay, 24 VDC / 0,3 A, binary or proportional mode • 1x 4-20 mA (output charge ≤ 500 Ω)
(*) The input / output logical and analogue have the same Common, not isolated themselves	
	Other Specifications
Rules:	• Up to 1000 programming rules • Logic, Compare, Sign, Combination, Regulation function, Calendar and more
Event Memory:	Up to the last 100 events
Temperature range:	-10°C to +80°C
Protection:	• IP68 version (solenoid & junction box IP65) • Against excess temperature • Against short circuit and over voltage
Interface:	Plug & Play / NT / 2000 / XP / Vista / Win 7
	Default mode
Troubleshooting:	Screening 8 inputs dynamically Output status modification without programmed rule changes
Remote command failure:	Options available: maintain current position, go to close position, go to open position

3.3 CONNECTION

Input: Sensor Passif

LIN005UE-01
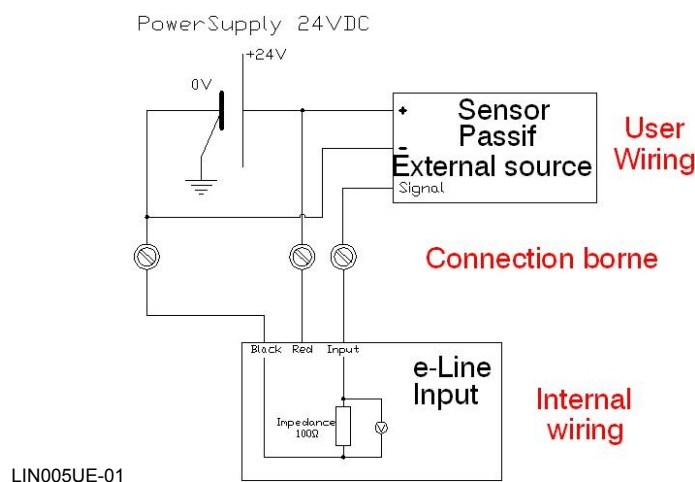
Input: Sensor Actif

LIN005UE-02

Output

LIN005UE-03
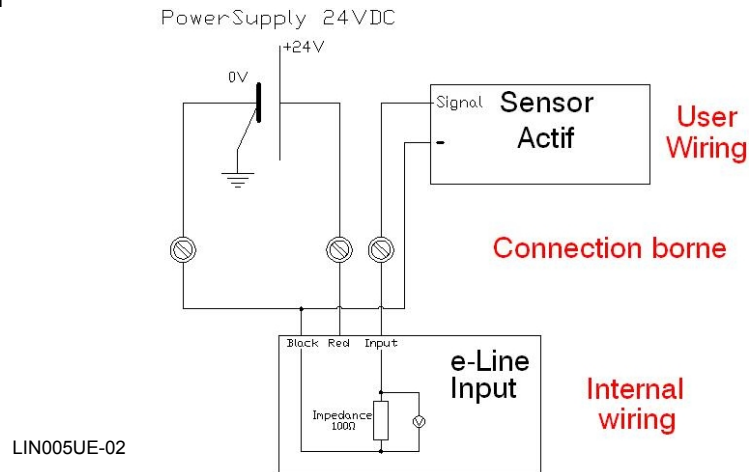
3.4 INSTALLATION INSTRUCTIONS

1- All installation, adjustment and maintenance should be carried out by a competent electrician.
2- Do not exceed the maximum ratings given in the specifications and printed on the label.
3- The electrical connections should be made as described in the user's manual.
4- Before any maintenance operation the main power should be turned off.

⚠ : Do not attempt to open the product as this will invalidate the warranty!

3.5   SOFTWARE / FIRMWARE UPDATE

For Software updates please refer to our web site **www.cla-val.ch**.
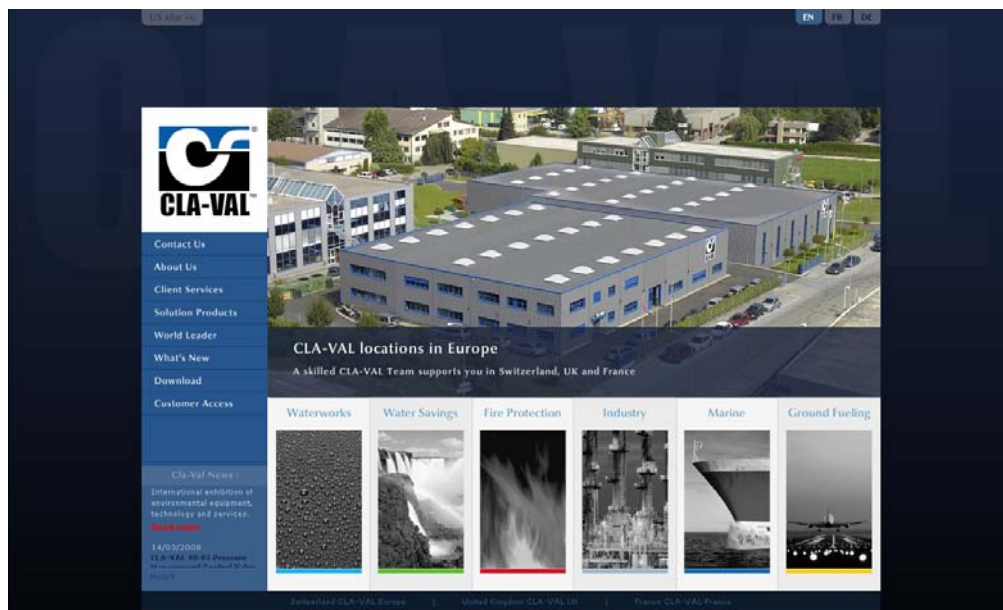
Select **"Download"** and **"e-Line"**. You will find all the latest Software (PC) & Firmware (Internal Software) updates. Just click on the link to download automatically.

All the Software is Multilanguage, only the install Software is in English.
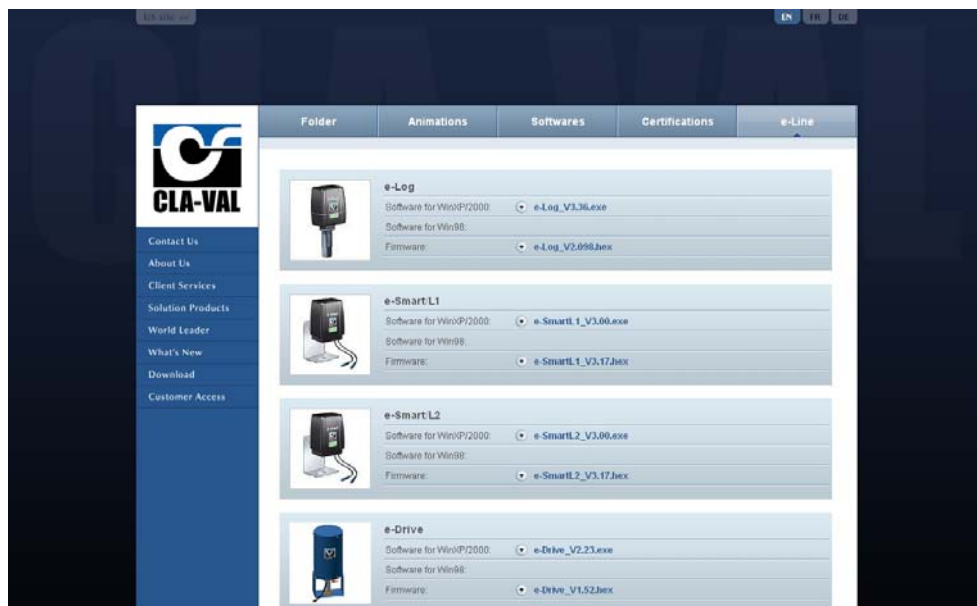
3.6 FIRMWARE UPDATE (INTERNAL SOFTWARE)

⚠ : Before the Firmware update, save your program on your PC.

1- Connect the USB wire to the USB connection of your PC.
2- Connect the e-Smart/L2 to the USB wire.
3- Select **"Read Parameters"** in order to read e-Smart/L2 settings and record output parameters.
4- Select **"Firmware update"** in **"Parameters"**.
5- Open the corresponding file ".hex".
6- Select **"Read Parameters"** in order to check that the Firmware is updated.

3.7 INSTALLATION DRIVER USB

When you connect the e-Smart/L2 cable for the first time, your PC will detect it and request a driver.

Windows 1

a. Select **"Cancel"**.
b. Instal the software "Multi-USB driver setup" on your PC (you can download this software on internet **www.cla-val.ch**).
c. When you see this message below, select **"Continue Anyway"**.

Windows 3

Installation of the driver USB is now finished.

Windows 5

3.8 UPDATE DRIVER USB OR INSTALL ON ANOTHER PORT

To update your USB driver, please follow procedure below. Install the Software «Multi-USB Driver Setup» downloads on our web site **www.cla-val.ch**.
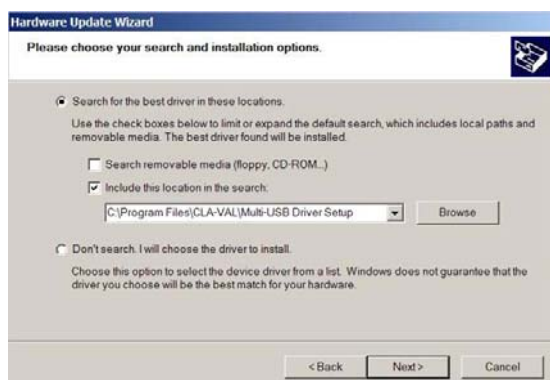
Connect your cable USB to your PC.

a. Select: "Install from a list or specific location".

Windows 1

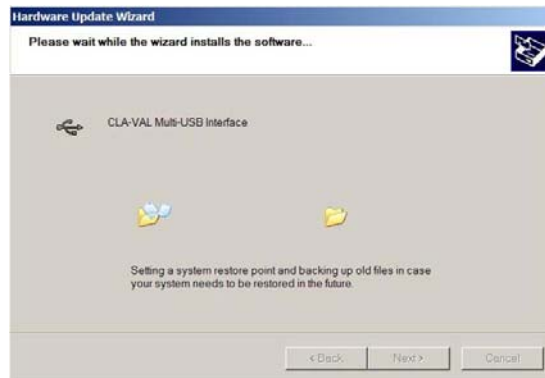b. Browse to file: **C\Program Files\CLA-VAL\Multi-USB Driver Setup**.

Windows 2

c. Microsoft validation press "**Continue Anyway**".

Windows 3

d. Installation.

Windows 4

e. Installation completed.

Windows 5

Visit our web site **www.cla-val.ch** frequently in order to download freely the latest update and news.

3.9 CONFIGURATION MODE

To launch e-Smart/L2 Software when not connected to your PC, the e-Line list (which allows the multi connection of e-Line products) is empty (see picture below), click **"Cancel"**.

GEN001

If you are connected to one or more e-Smart/L2's or another e-Line product, click on **"View All"** then select the e-Smart/L2 you would like to communicate with from the list (see picture below) then click once on left mouse button.

The name of product, Firmware version and serial number are displayed.
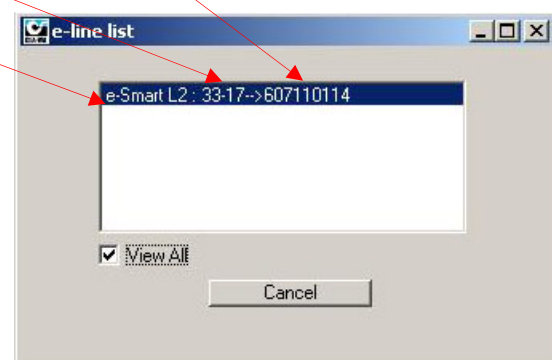
LIN005U-01

If your e-Line product isn't updated with the "Multi connection" version, the e-Line list stays empty. Click on **"View All"**, the e-Line product appears with name **"Generic e-Line"** (see picture below), then click once on left mouse button on this line to communicate with the product.

For the name and serial number of this product to appear, a Firmware update is necessary (see chapter 3.6).
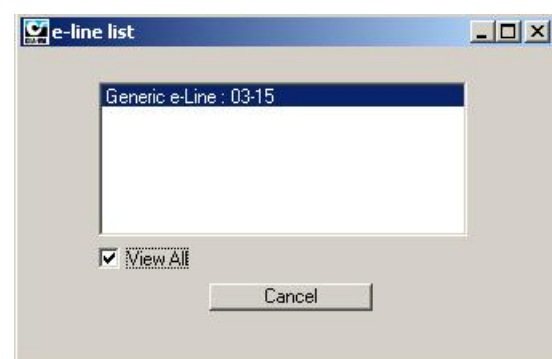

GEN002

When you start e-Smart/L2 software, if your e-Smart is not connected to a computer, you have to select manually in which mode you want to work ("**e-Smart L1 Digital output Battery**" or "**e-Smart L2 Digital output 24V**" or "**e-Smart L2 Analogue output 24V**"), and then click on "**Ok**".
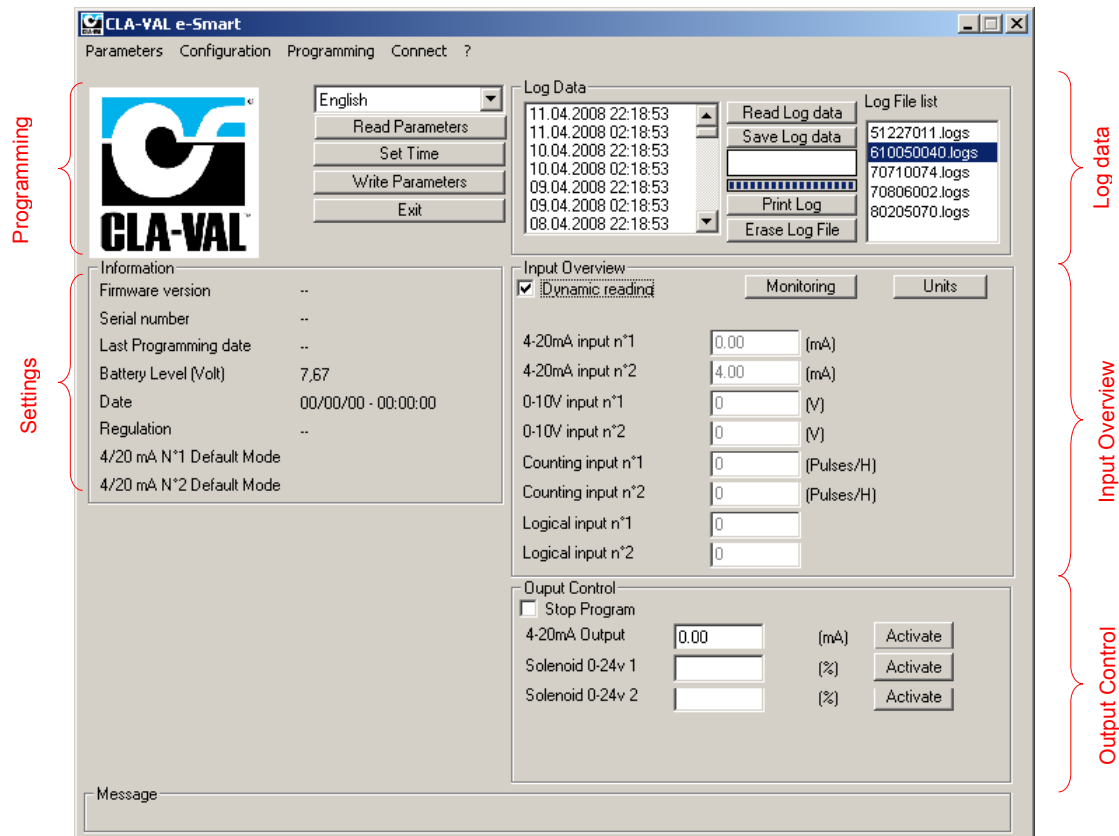
Reminder:　　e-Smart L1 Digital output Battery:　　e-Smart with battery

　　　　　　e-Smart L2 Digital output 24V:　　　e-Smart 24 VDC automatic mode

　　　　　　e-Smart L2 Analogue output 24V:　　e-Smart 24 VDC controller mode
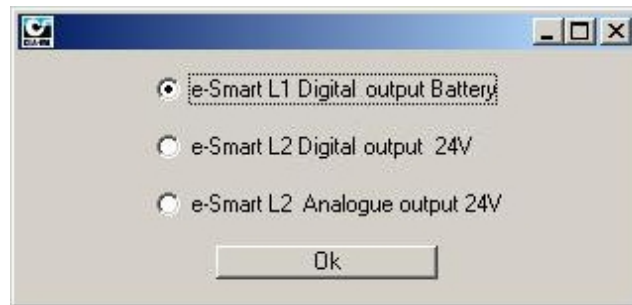
LIN028U-02

3.10 ASSISTANCE MODE

LIN005UE-04

▸ Log Data:

- This option is activated automatically as soon as the e-Smart/L2 changes the outputs status i.e, the hydraulic system. After that, the events are logged and classified as historic files.

▸ Input Overview: (8 Inputs)

- 2 logical inputs (0-1).
- 2 inputs 4-20 mA.
- 2 inputs 0-10 V.
- 2 counting inputs.

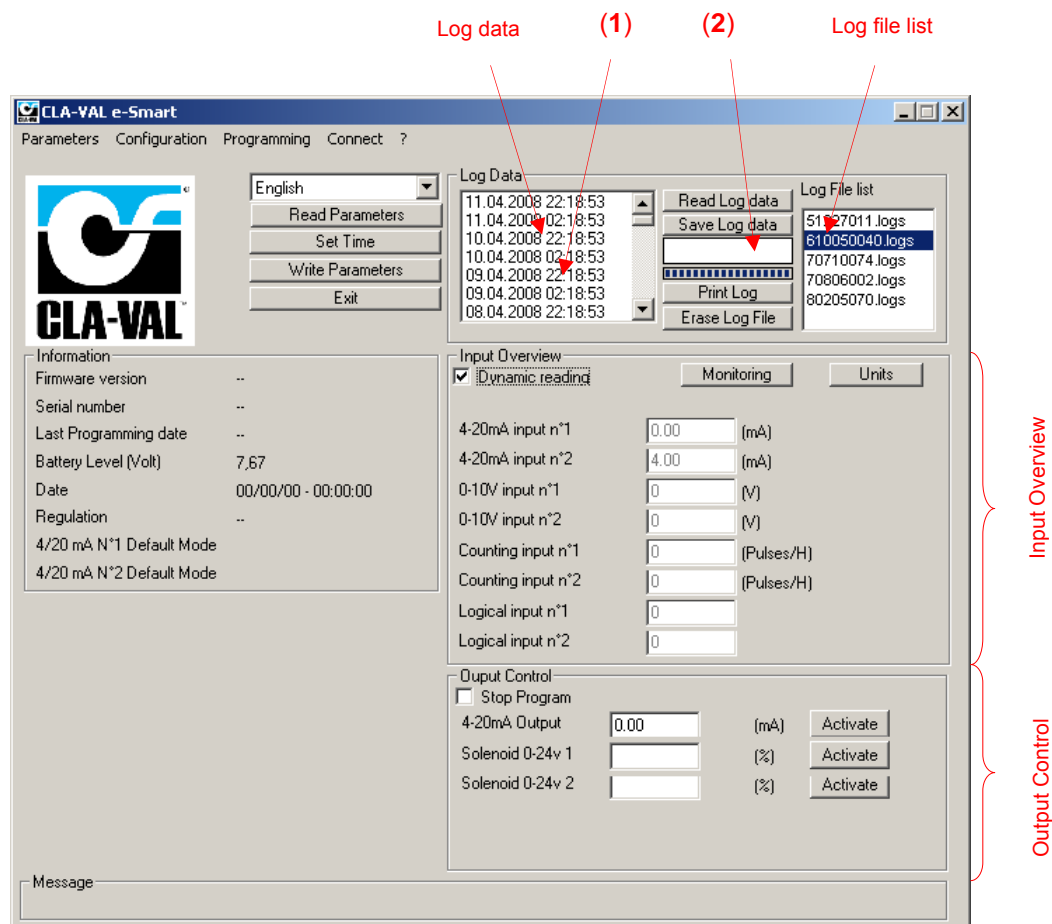▸ Output Control: (3 Outputs)

- 2 latch outputs.
- 1 output 4-20 mA.

3.10.1 LOG DATA READING (HISTORIC FILES)

To read the last 100 log events into the e-Smart/L2 where you are connected, click on **"Read Log data"** to downloaded.

Each line in the window is a date/time and event change; when you click on a line (**1**) in the window **"Input Overview"**, **"Output Control"** and **"Information"** displays the corresponding values.
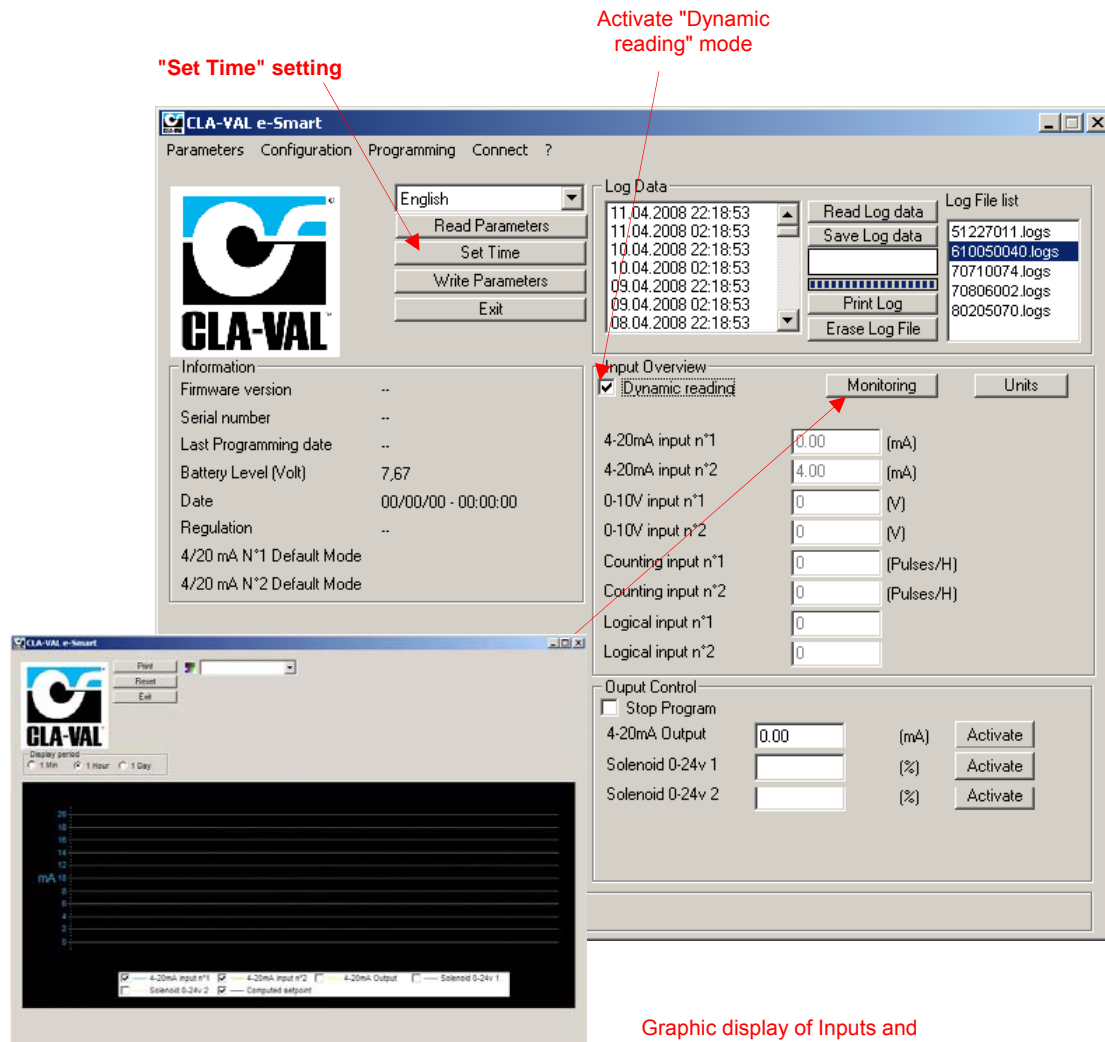
You can save the data logs to your PC by entering the file name in window (**2**) and clicking on **"Save Log Data"**. Saved files appear into the window on the right.

If necessary, you can print or delete the logs files by selecting the logs file into the log file list, click on **"Print Log File"** or **"Erase Log File"** following your choice.

LIN005UE-04

3.10.2 "DYNAMIC READING" MODE

"Set Time" setting

Activate "Dynamic reading" mode

LIN005UE-04

Graphic display of Inputs and Outputs in real time

LIN005UE-05

: a- Dynamic reading: the output values are read continuously. This allows you to check if the external sensors work correctly.

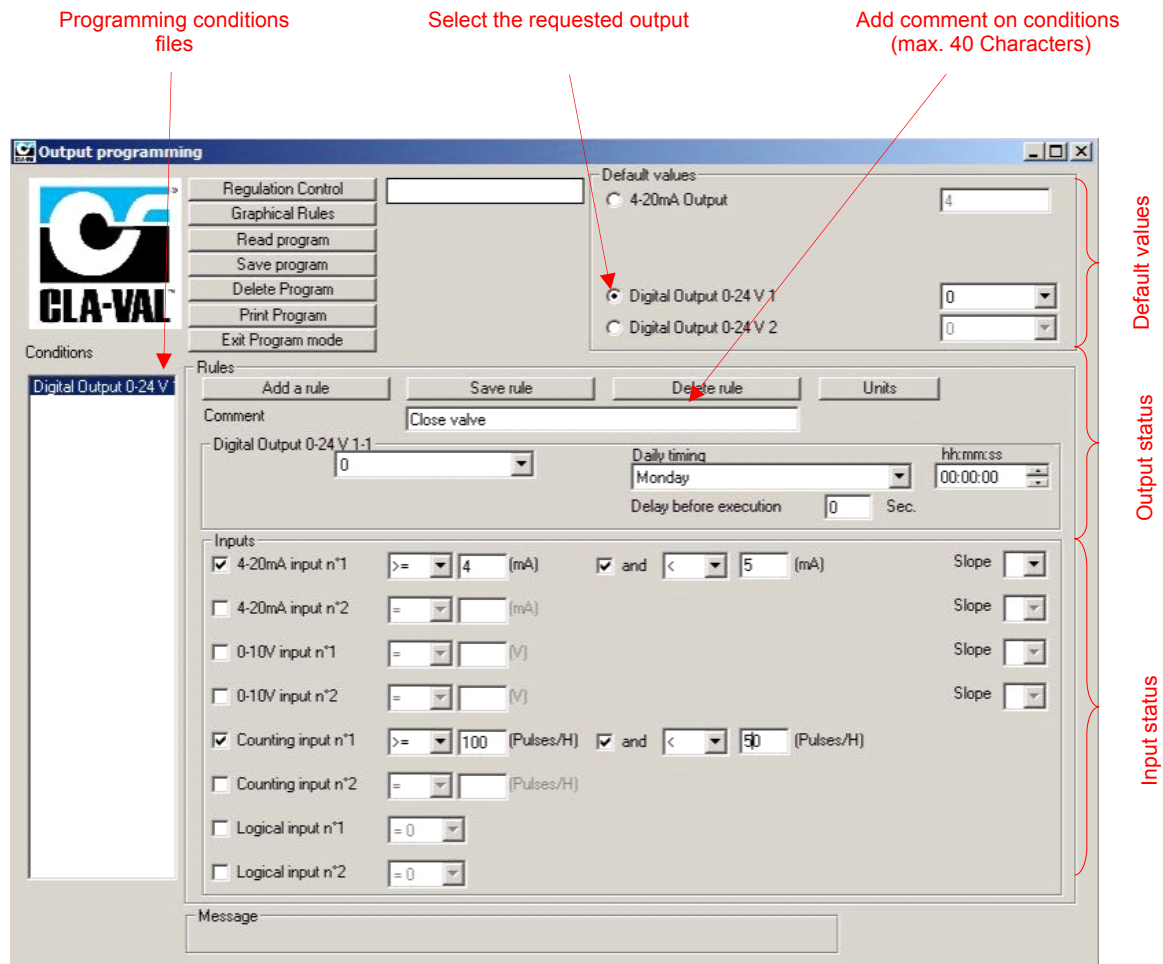b- If you select **"Stop Program"**, the program's running is frozen until you click it again.

c- You can override the output value by clicking on **"Activate"**. Don't forget to first disable the **"Dynamic reading"**.

d- If you click on **"Set Time"**, you readjusted internal timer of e-Smart/L2 corresponding at the time into your PC without loss of the program or parameter.

It's necessary to set the time when you first connect to e-Smart/L2 or when you have a power failure, in order to send the GMT time into the e-Smart/L2.

The GMT time parameter is read automatically from the PC when you are setting the e-Smart/L2.

3.11 CONDITIONS PROGRAMMING

Programming conditions files

Select the requested output

Add comment on conditions (max. 40 Characters)

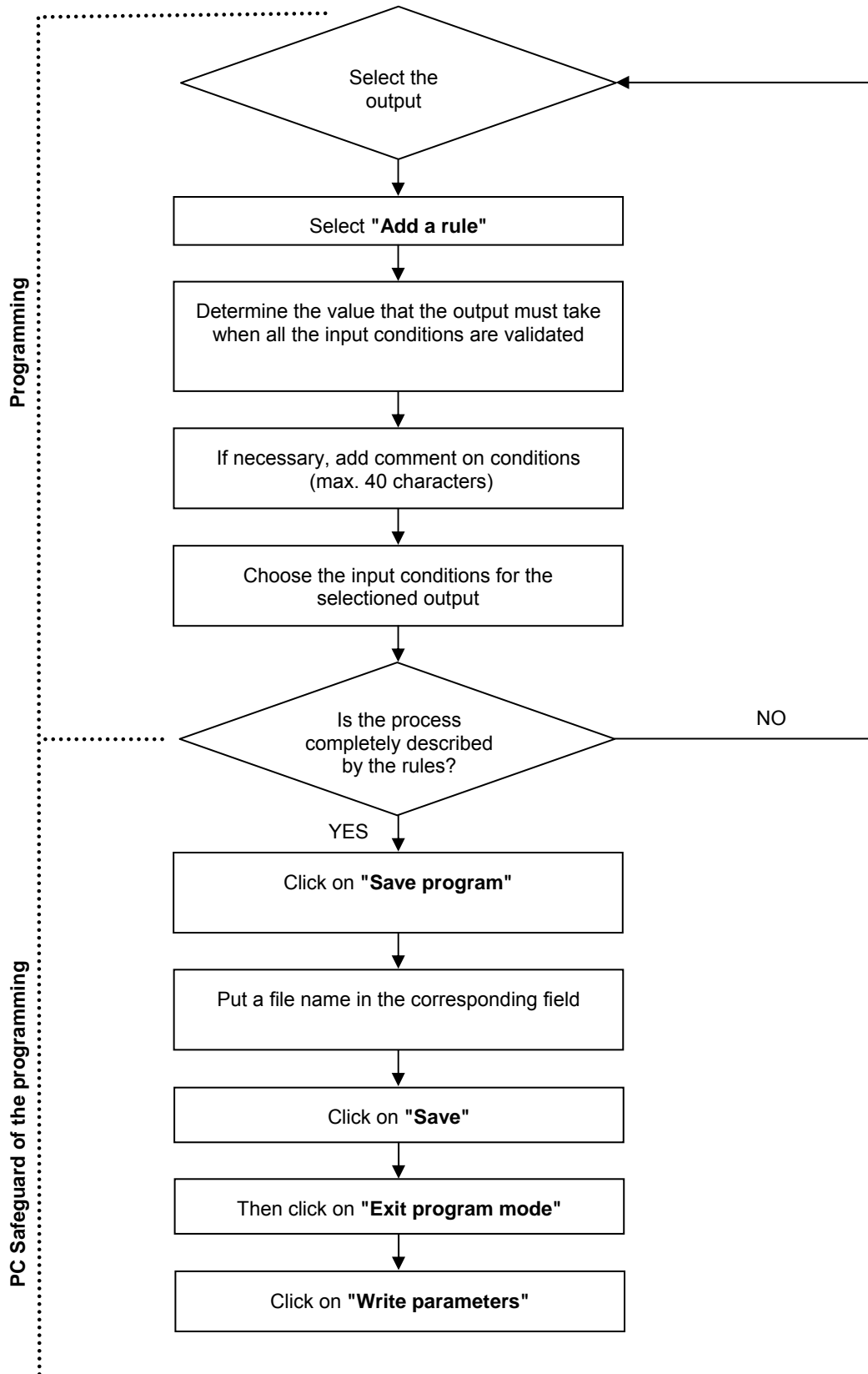Default values

Output status

Input status

LIN005UE-06

: a- The default value from the last condition will be applied and when the USB cable is unplugged or when default mode condition is selected (cf chapter 3.14.7).

These values have **held as far as one condition has true or the signal 4-20mA loss to comeback.**

After a power failure, the first action of e-Smart/L2 is setting the default values.

b- A condition is a rule that you define from the output to the input.
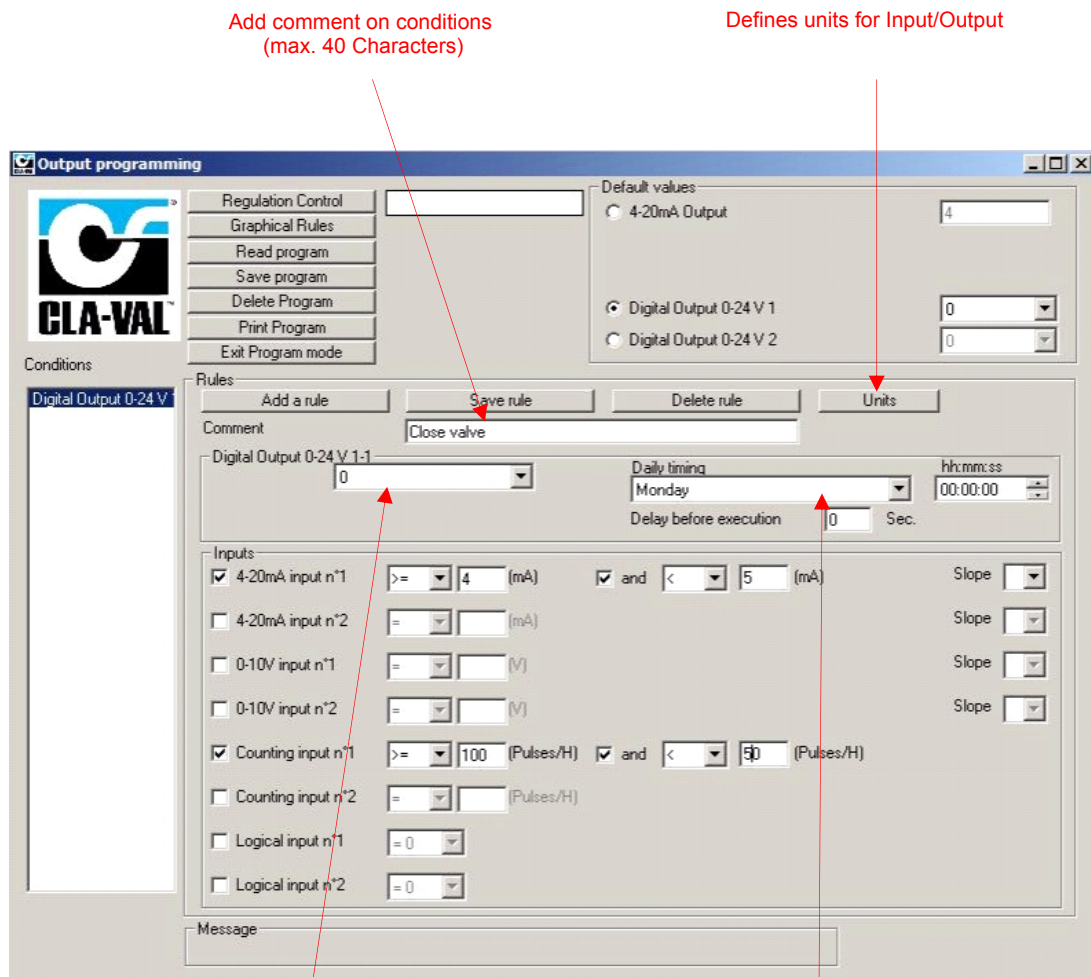
c- In order to activate a condition, *all* selected conditions must be validated.

Programming

Select the output

↓

Select **"Add a rule"**

↓

Determine the value that the output must take when all the input conditions are validated

↓

If necessary, add comment on conditions (max. 40 characters)

↓

Choose the input conditions for the selected output

↓

Is the process completely described by the rules?

NO

YES

PC Safeguard of the programming

Click on **"Save program"**

↓

Put a file name in the corresponding field

↓

Click on **"Save"**

↓

Then click on **"Exit program mode"**

↓

Click on **"Write parameters"**

3.12 EXAMPLES OF USES

3.12.1 PROGRAMMING

1- Connect the USB wire to the USB connection of your PC.

2- Connect the e-Smart/L2 to the USB wire.

3- Select **"Read Parameters"** in order to read e-Smart/L2 settings and record input and output parameters.

4- Select **"Programming"** in order to program outputs and inputs.

5- Select your program in the list *OR* do your program according to the diagram at the paragraph 3.11.

Add comment on conditions
(max. 40 Characters)

Defines units for Input/Output

LIN005UE-06

Choose the output value

Choose the daily timing

If you want to choose a daily timing, determine the time.

You can adjust Input/Output Analogue 4-20 mA according to the units used.

Programming day

Beginning time
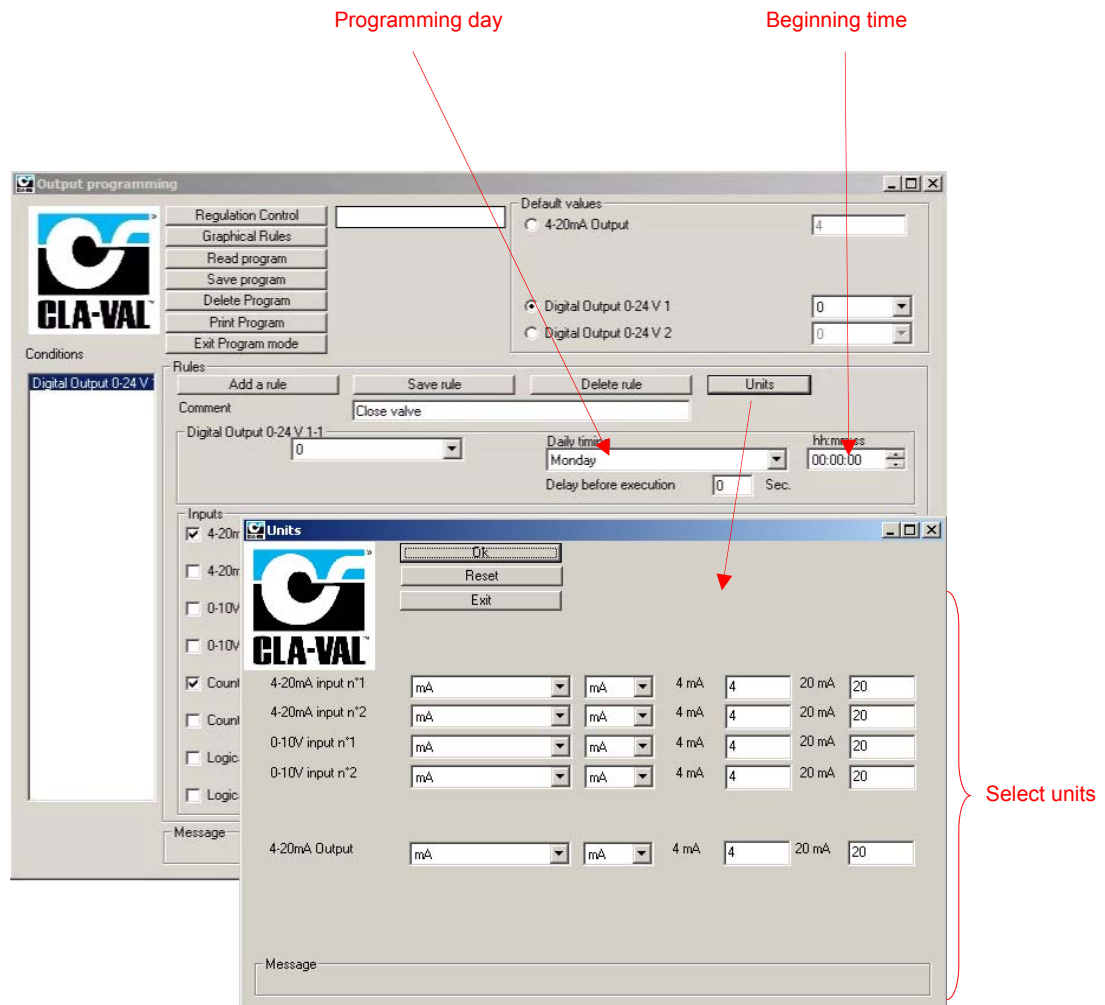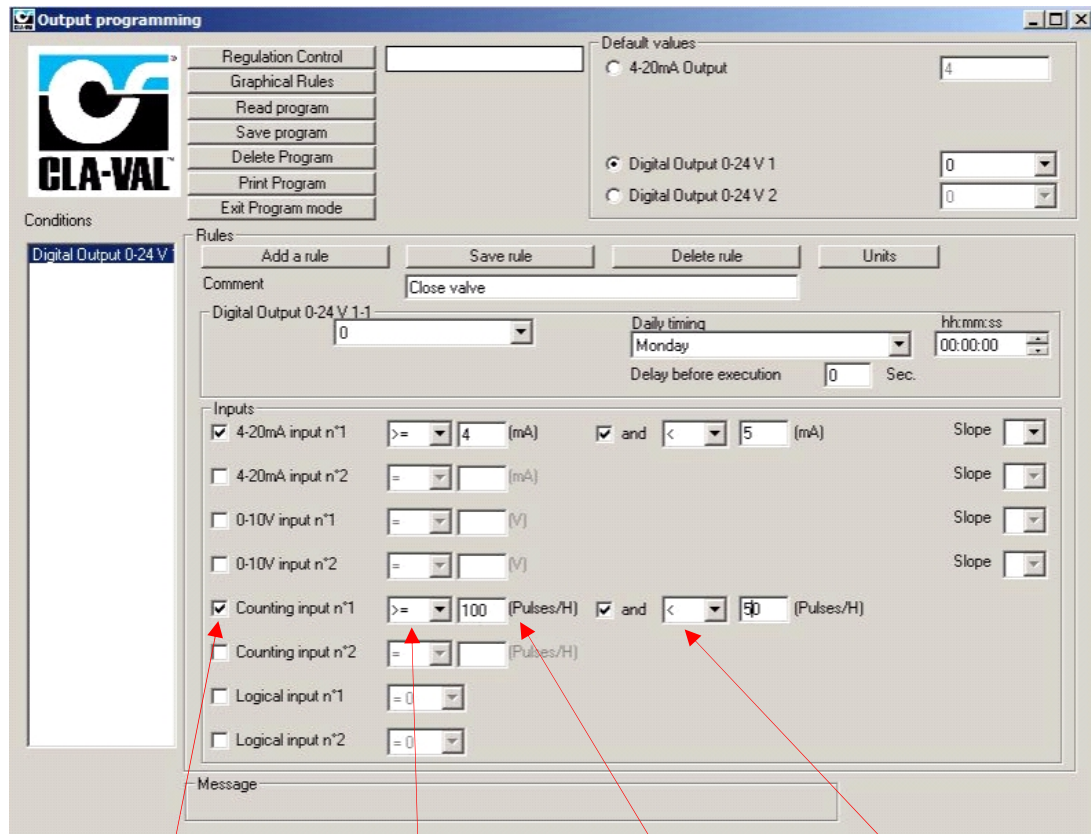
LIN005UE-07

: a- Period programming: Definition of an **enable** condition all the days **between** two hourly boundaries.
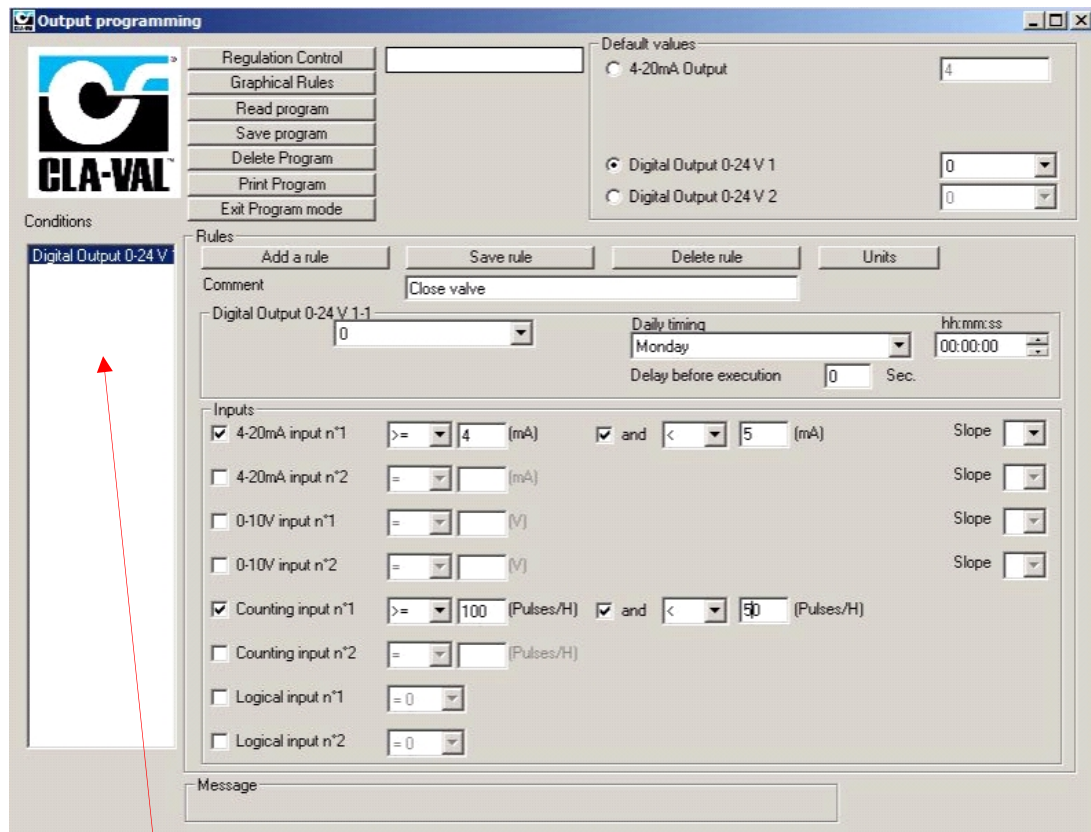
6- Inputs programming.

LIN005UE-06

Input selection   Logical operator   Desired value   Possibility to define an interval

7- Select **"Save rule"**, as soon as the inputs and output rules programming is finished.

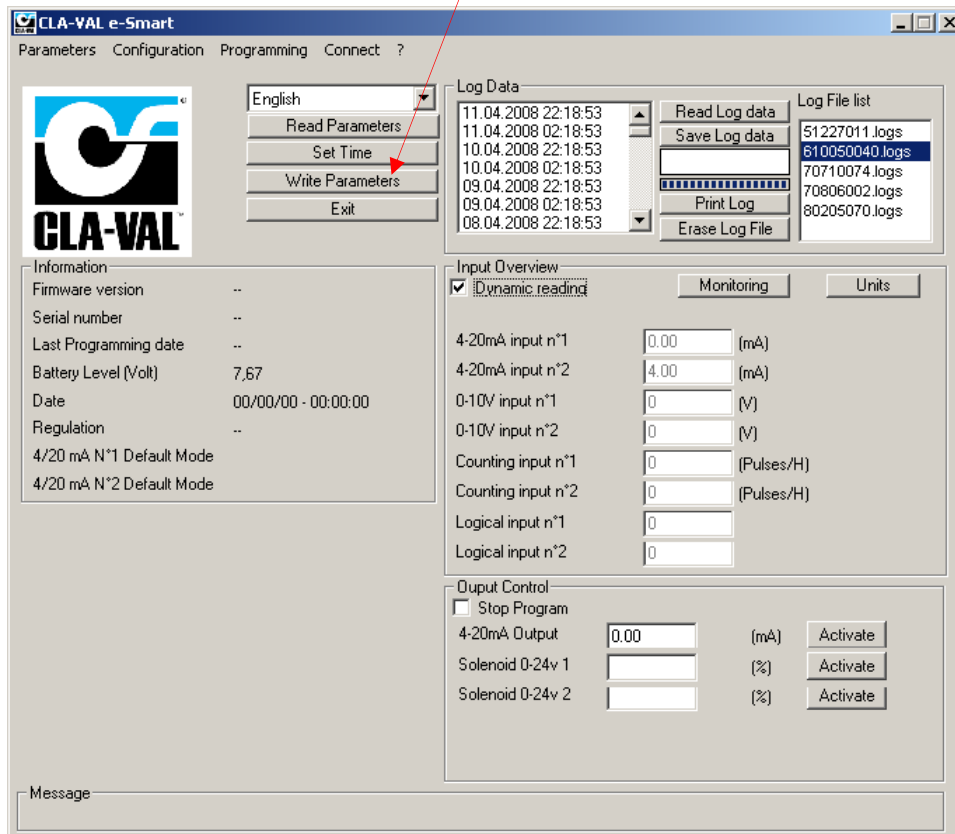

LIN005UE-06

Conditions list for the
corresponding output

8- Choose an output and select **"Add a rule"** if you want to do other conditions, (don't forget to select each time **"Save rule"** for each modification).

9- Once all rules have been created, click on **"Save Program"** and add name to save to your computer.

10- Select **"Exit"**.

Program name saved

Windows for saved program
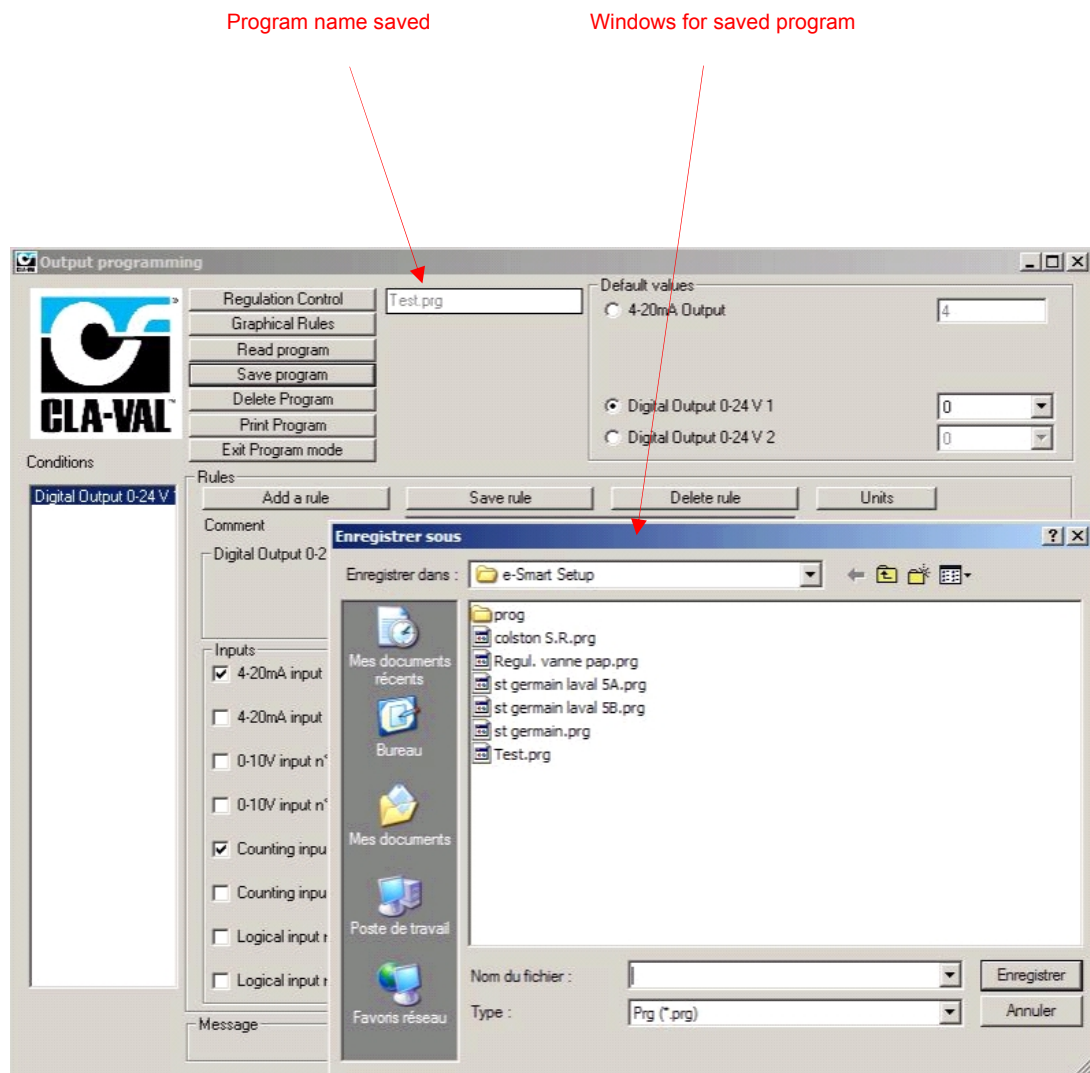
LIN005UE-08

11- Select **"Write Parameters"** in order to upload e-Smart/L2 settings.

Write Parameters

LIN005UE-04

3.13 SPECIAL MONITORING FEATURES
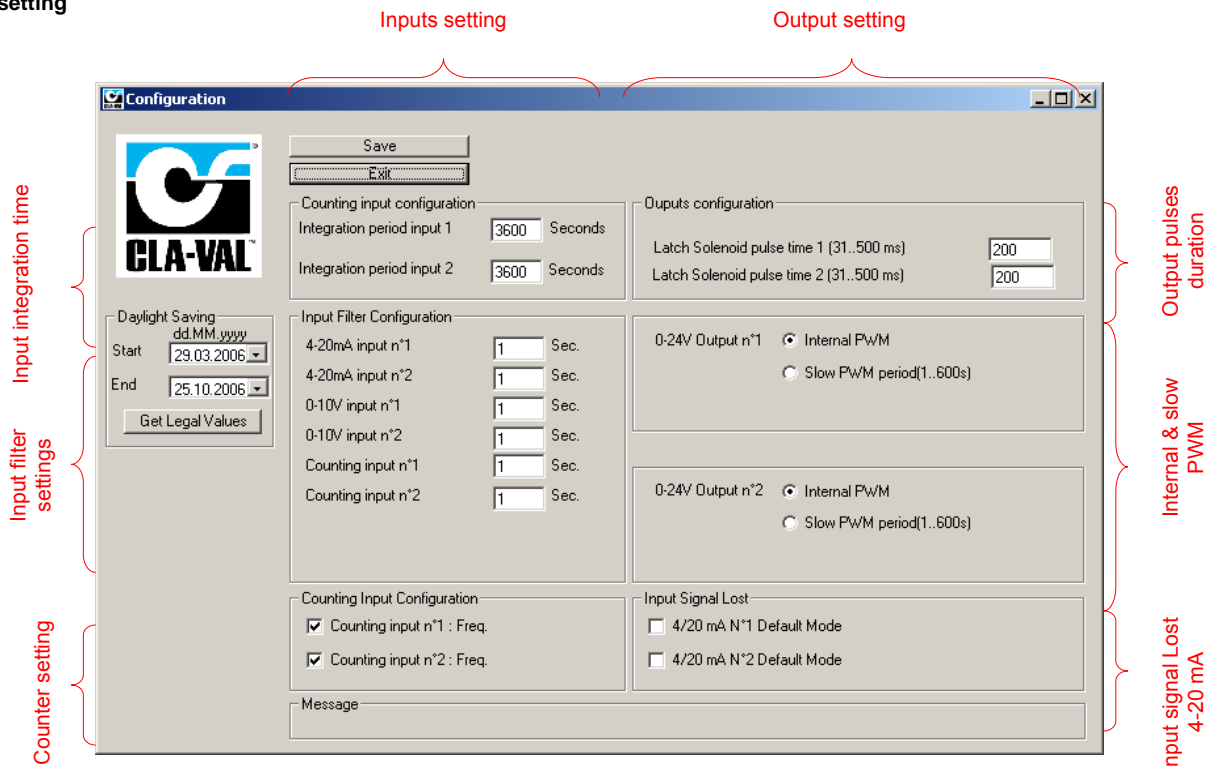
3.13.1 STOP PROGRAMS

When you are in dynamic reading you can not enter figures into the output control otherwise they are overwritten by the reading.

To be able to apply specific values on the output, remove the flag in dynamic reading and select **"Stop Program"**, and then enter figures into the corresponding fields.

To restart the program, click it again.

3.14 SETTINGS

Inputs setting

LIN005UE-09

3.14.1 INPUT INTEGRATION TIME

This period is corresponding to the maximum allowed time between 2 pulses; if the time counting is higher then the value will be 0.

3.14.2 OUTPUT PULSES DURATION

The output pulses duration of the electro valve corresponds to the width of the pulse applied to the bistable electro valve. This parameter can be used to modulate the output command duration for the bistable electro valve (configuration of internal PWM).

: a- PWM = Pulse Width Modulation

3.14.3 INPUT FILTER SETTINGS

This parameter allows to filter the incoming signal from the 4-20 mA / 0-10 V or counting input. Higher it is (maximum 80 s), stronger is the filtering, at 1 sec there is no filtering.

3.14.4 INTERNAL PWM

Must be selected, in order to command the solenoid 0-24 V. The selection of internal PWM can activate the command of solenoid with a PWM at 50 kHz. It can vary from 31 to 500 ms.

3.14.5 SLOW PWM

This option should be enabled when you want to control a step by step valve. Introduce the corresponding solenoid cycle time. The selection of slow PWM can be used to parameterize the cycle time between 1 and 600 s.

3.14.6 COUNTERS SETTING

- If the pulses input is enabled (clicked), then it is working in frequency (pulses/h).
- If the pulses input is disabled (not clicked), then it is counting (pulses).

3.14.7 INPUT SIGNAL LOST 4-20 mA

Once selected, in case of loss of input signals 4-20 mA, the default actions are to be applied (cf. Chapter 3.11).

By default (box not selected), in case of loss of input signals 4-20 mA, the e-Smart continues in the status of its last command.

3.14.8 DAYLIGHT SAVING:

Information on the day when the time summer/winter change. When you click on Get Legal Values, you download this information into the e-Smart/L2 from your PC

3.15 DELAY FUNCTION

The delay function allows to delay the effect on the selected output.
The corresponding output will be activated *ONLY* after the delay *AND* if all the requested inputs are valid.

If during this time one of the requested inputs is not valid, the delay (countdown) restart.

3.16 FLOW CONTROL

The graphic interface allows to generate easily the rules for a flow control application.

3.16.1 PRESSURE/VERSUS FLOW

First of all draw the curve versus pressure on a paper and count how many articulation point you have.

1- Choice set point origin

2- Click on **"Units"**.

3- Select **"Flow"** and units.

Data point
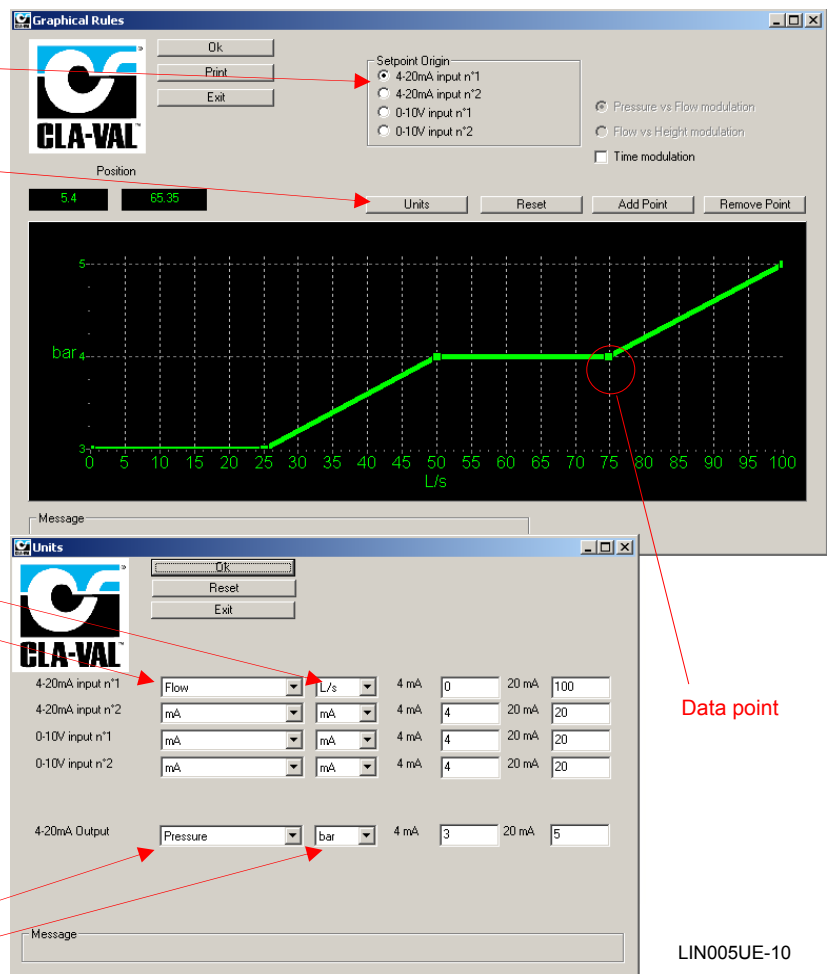
4- Select **"Pressure"** and units.

5- Click **"Ok"** and **"Exit"**.

6- To create your prefered number of data points (maximum 10 points).

7- To modify the profile, you move the data point with the mouse.

8- When finished click on **"Ok"**, then **"Exit"**.

Your rules are ready to be programmed (cf chapter 3.12.1 point 9-).

LIN005UE-10

: a- To zoom in, press the left mouse button and drag the curser to the right. To unzoom, press the left mouse button and drag curser to the left.

3.16.2 FLOW VERSUS LEVEL

First of all draw the curve versus pressure on a paper and count how many articulation point you have.

1- Choice set point origin.

2- Click on **"Units"**.

3- Select **"Height"** and units.

Data point

LIN005UE-11

4- Select **"Flow"** and units.

5- Click **"Ok"** and **"Exit"**.

6- To create your prefered number of data points (maximum 10 points).

7- To modify the profile, you move the data point with the mouse.

- With hysteresis selected (cf chapter 3.16.3), you can create 2 profiles which allows independant filling and draining profiles.

8- When finished click on **"Ok"**, then **"Exit"**.

Your rules are ready to be programmed (cf chapter 3.12.1 "Programming" point 9-).
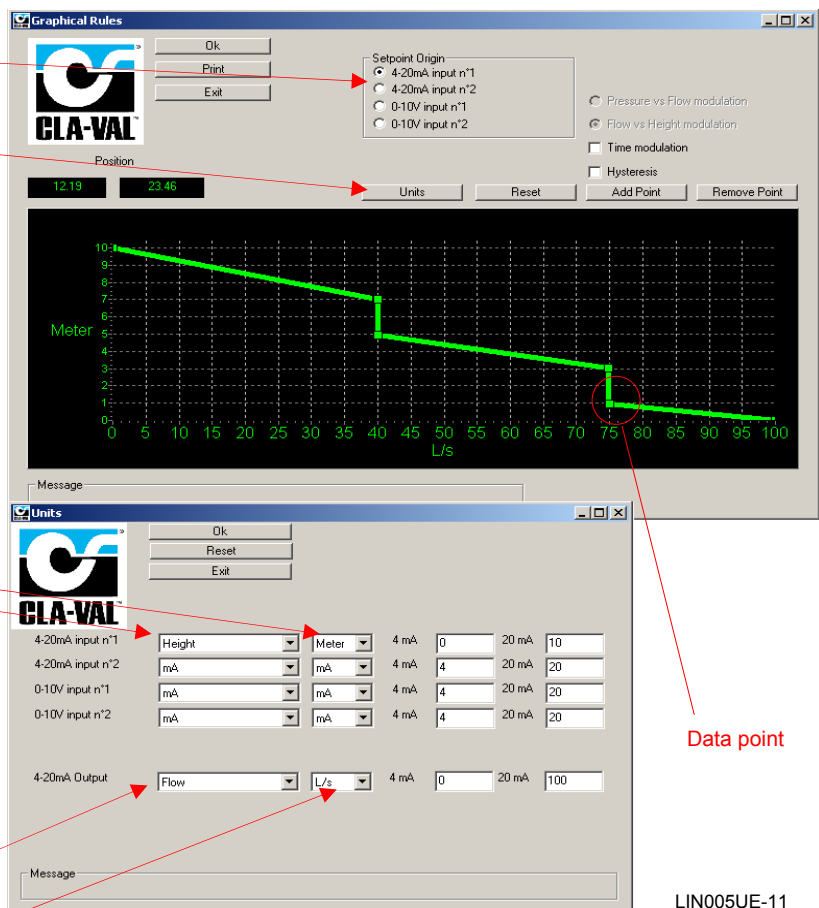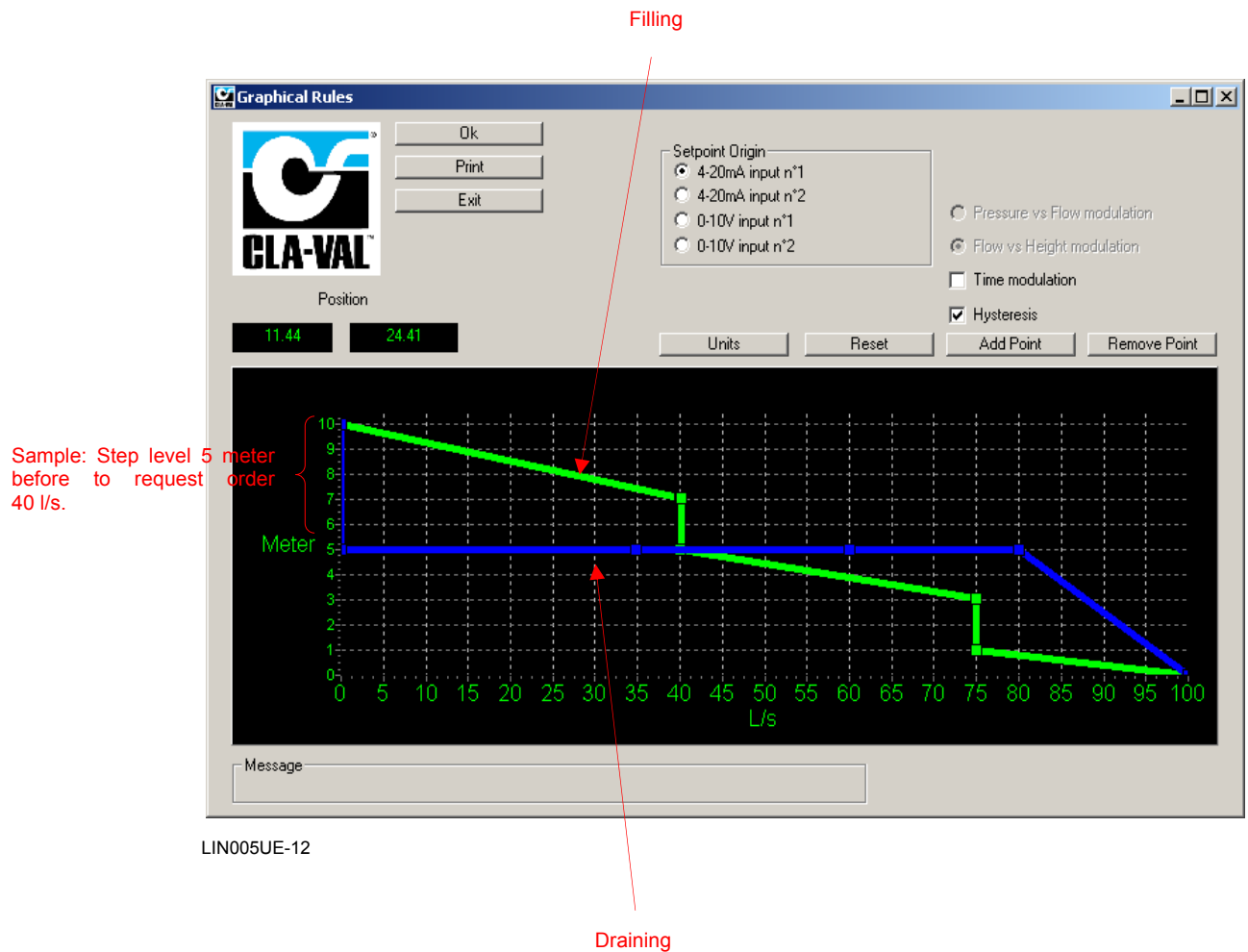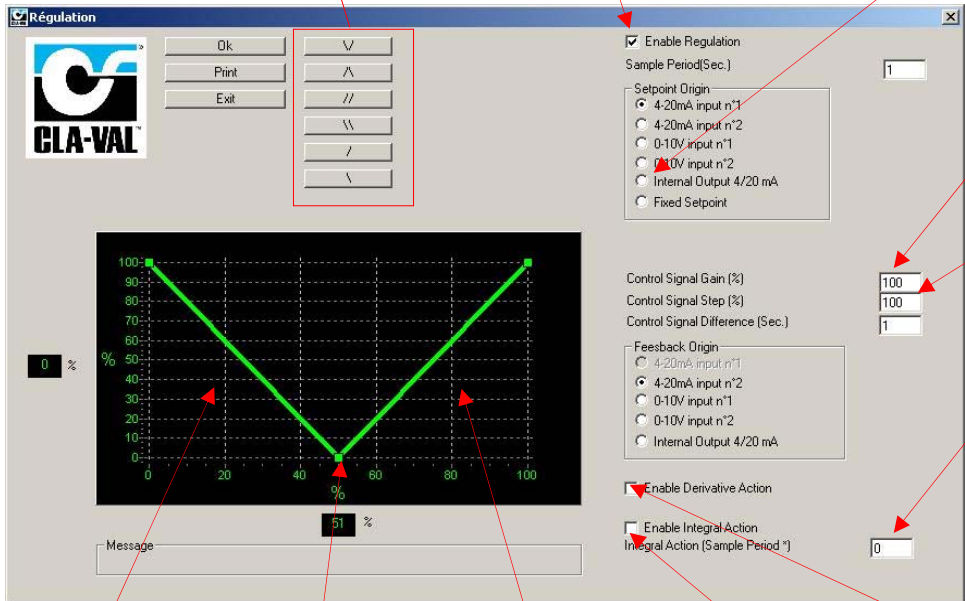
3.16.3 OPTION: HYSTERESIS

With hysteresis selected you can create 2 profiles. Adjust blue data point for draining and green data point for filling.

LIN005UE-12

3.17 REGULATION CONTROL

The graphic module of regulation controls can be used to generate automatically a program corresponding to the required function.
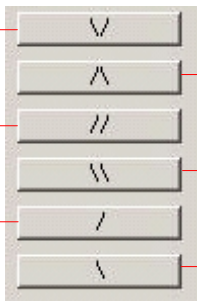
3.17.1 CHOICE OF THE REGULATION MODE

See detail A below

Selected to validate the regulation

Selected in case of step by step regulation related to the flow curve (cf. chapter 3.16) internal feedback

Value in % emitted on the demanded command

Smooth of command step according to a % and a time

Range 0.1 to 0.9

LIN005UE-14

Regulation zone solenoid downstream

Command point with an adjustable dead zone

Regulation zone solenoid upstream

Selected for activate integral action (with time on sample period integral)

Selected for activate derive action

Détail A

Regulation Curve Step by Step solenoid1 & solenoid2 NC

Regulation Curve Step by Step solenoid1 & solenoid2 NO

Regulation Curve Step by Step solenoid1 NC& solenoid2 NO

Regulation Curve Step by Step solenoid1 NO & solenoid2 NC

Regulation Curve positif on pilot CPC

Regulation Curve negatif on pilot CPC

LIN005U-02

3.17.2 PARAMETER SETTINGS

First, please make sure that the analogical mode has been selected when you connect the e-Smart L2 (cf. Chapter 3.9).

1- Click on the tag **"Configuration"** on the homepage of the e-Smart (cf. Chapter 3.14).
2- Select a slow PWM duration for the output 0.24V1 & 0.24V2. The time introduced for a good regulation must be proportional to the Dn of the valve and ranging between 1 & 8 seconds.
3- Once you finish the setting of curve and parameters, click on **"Save"** then **"Exit"**.
4- Now click on the tag **"Programming"**, then **"Regulation controle"**.
5- Select the regulation curve according to your application (cf. Chapter 3.17.1).
6- Move the points of the curve by using the mouse to obtain the regulation slope and the required dead zone according to your command. Step by step action + or – faster coresponding angle to the slope regulation.
7- Introduce the values of parameters of the regulation curve (sampling interval / command value / step changes of command / sample periode derive or sample periode integral).
8- Once these values introduced, click on **"Configuration"** then **"Exit"**. You can save your programmation.

Your regulation curve is ready to for programming (cf. Chapter 3.12.1 point 9-).

3.17.3 REGULATION MODE AND FLOW CONTROL

In case of regulation related to flow control, apply procedure 3.17.2 with the control of required flow (cf. Chapter 3.16).

⚠ Remember to select the box **"Internal output 4-20mA"**, otherwise the internal looping of the flow control will not run (cf. Chapter 3.17).

4 ▶ TECHNICAL INFORMATIONS

4.1 TROUBLESHOOTING

Problem	Check
▶ The software is not working	Do you have full access rights?
▶ No PC connection ▶ e-Smart/L2 missing	• Check if the USB driver is working • Check if you have power supply • Disconnect the cable and then connect it again

If any other problems occur:

Please contact the technical support on our website: **www.cla-val.ch**.

5 ▶ SOME TIPS

: a- The led will light red one time when you disconnect the USB cable.

b- The led is flashing green if the e-Smart/L2 is running without changing.

c- The led is flashing red each time that the e-Smart/L2 is changing one of the output.